Iridium is a famous case in which Motorola and other well known companies invested about $5 billion in a satellite venture that would enable a person to use his cell phone around the world. The investment included more than $2.2 billion in debt. Soon after operations began, the company declared bankruptcy and its assets were ultimately sold for only $25 million, leaving the lenders with a total loss. It is obvious that projections made by the company and endorsed by the most prestigious banks on Wall Street were comical leading to massive losses for banks, debt investors and equity investors. It is also clear that the company made some mistakes in marketing such as not having sufficient phones available after a major advertising campaign. The questions I would like you to address in this case are what was underneath the crazy assumptions and financial projections made by these highly respected financial institutions and how could the banks and other institutions made the loans.

**Step 1: Skim over the Case Write-ups**

Because the case was such a dramatic failure, a number of case studies have been written on the case. For background, I have attached three case studies written on the case (one from Harvard, one from Northwestern and one from Thunderbird) as well as financial documents published by the company. You do not have to read everything in detail, but just skim through the readings three cases to get a general idea what the case is about (I think it is easy reading).

**Step 2: Mechanical Modelling Issues**

I have used data from the case studies and actual financial statements to create a “base case” financial model. In preparing the case, the first step (after reviewing the three readings) is to fill in the blanks for various items in the model. The idea behind doing this is so that you understand the mechanics of the model and see some of the complications of a more realistic model than the ones we completed in class. To do this, fill in the grey areas of the sheet:

* Compute the capital expenditures from the number of new satellites required in the subsequent year (change the lifetime of the satellites and see how the capital expenditure changes).
* Compute the number of subscribers that were supposed to be realized from business travelers through multiplying the travelers by the penetration by the sensitivity factor.
* Compute the total revenues from minutes of usage realized by Iridium in the base case.
* Compute the cost per hour experienced by users in the base case.
* Compute the Accounts Payable and the total working capital
* Compute the Debt Balance for Senior Debt B (See how it was done for Senior Debt A).
* Compute the Aggregate Senior Debt Balance
* Compute the Default and Repayment of Default on Subordinated Debt
* Compute the amount of senior and sub debt outstanding at the end of the projections.

**Step 3: Risk Analysis**

After completing some of the mechanical steps of the model, I would like you to do some sensitivity analysis, break-even analysis and scenario analysis.

* Make a graph that shows the amount of senior debt outstanding as a function of penetration rate realized by Iridium and the price charged by Iridium. The title of the graph should show the number of subscribers in 2002 and the total cost per hour for the subscribers as well as the sensitivity factors for the penetration and the \_\_\_
* Use a data table and the sensitivity factor on the penetration rate to compute the minimum number of subscribers required to break-even from the standpoint of senior debt.
* Run a case with much lower prices – down to $.25 per minute on a retail basis (do this by adjusting the \_\_\_. Then increase the usage and compute the amount of usage required to break-even.
* Pretend that a downside case involving a maximum penetration for business travelers was 5% and that the maximum effective price results in a charge of $50/hour. If the satellite life were extended to 14 years and the Motorola contract were cut in half, could this more realistic scenario have worked and allowed the debt to be re-paid. (When the company was sold for $25 million, the contract was dramatically reduced and the new company is using a 14 year satellite life.)

**Step 4: Project Viability**

The ultimate test is whether the technology is cost effective, despite all of the talk about marketing. The phones were obviously bulky and there were service problems because the phones were difficult to use in buildings. Despite all of this, if the price was low enough, the system may theoretically be viable. Since most of the costs were fixed, if the price was low enough to encourage much higher usage, maybe the technology would be viable. This is what I would like you to do next with the model. I would like you to modify the model, develop sensitivity analysis, create scenarios and perform break-even analysis with the model to address the following issues:

* Despite the marketing errors, use the model to test whether the project was economically feasible if marketing mistakes were not made – for example could the company have reduced prices and competed with standard cellular service.
* What is the price that could be charge with the maximum usage and still payoff debt.

**Step 5: General Discussion about Mistakes Made by Bankers**

* What are the biggest pricing drivers that made were wrong – was it the price of competing suppliers.
* Problem with maximum capacity of the satellites and the cost of the phones.

Discuss the mistakes made by lenders in making more than $2 billion of loans. Please do not simply say that the projections of the number of subscribers and the price realized by the company was absurd –we all know that now. Rather, discuss issues like:

* In general, can you make loans to companies when there is no operating history;
* Making projections of growth and ramp rates that were realistic;
* General problems with accepting work of marketing consultants without testing the analysis on an independent basis;
  + For example, not trying out the phone;
  + For example computing the cost of use per hour and evaluating how many people would really make such an expenditure;
* Attempting to understand the true cost of the technology relative to other technologies and the prices that must be charged to make it work
* Buying into the idea of a first mover advantage.
* Discuss the idea of demand elasticity – were the calls being made currently.

Address the question of whether an untested marketing plan on a new product with high prices is bankable under any circumstances. Why did the banks make the loans in the first place. Finally, address the question of whether any financial model at all is useful.

General issues to discuss:

* What would have happened to the project if the banks would not have made loans
* What should have been the discount rate applied to cash flows and how should the risk have been evaluated
* Is creation of a financial model a good idea so that one can see all of the explicit and implicit assumptions that are made
* What is the most important statistic in the model
* Comment on the layout of the model
* What statistics would you compute from the model

Discuss what risks – looking for obsolescence, no history to evaluate and not things like the volumes were not high enough.

We now know the whole idea was a complete disaster. However, I would you to test the original assumptions of the company. What if the growth did not materialize. What was the break-even penetration.

Make a decent model with combo boxes, scenarios, ability to make a break-even etc.

Iridium was having difficulty signing up customers. It had promised creditors that it would have 52,000 subscribers by mid-1999, and missing this target would cause the company to default on its loans. Staiano, an engineer by training, stuffed one of the brick-sized phones, along with its array of ungainly accessories and adapters, into his briefcase and headed to the meeting with Motorola. (An Iridium phone user needed to carry a bag full of attachments whose purpose was not always readily apparent.) The meeting got testy in a hurry, as Staiano flung open his briefcase, scattering the phone and gadgets across a table, and yelled, “You really expect business travelers to carry all this @&\*#¢?!”

The advantage of low-earth-orbit satellites was that they did not have the time delay problem of older, geostationary satellites, which had an altitude of 22,000 miles. Low-earth-orbit satellites were also much less expensive to produce and launch than the older satellites. A major disadvantage of the low-earth-orbit satellites, however, was their short lifespan, ranging from five to eight years, compared to fifteen years for geostationary satellites.

Iridium’s communication system is designed to enable its customers to send and receive telephone calls virtually anywhere in the world—all with one phone, one phone number, and one customer bill. Iridium’s system combines the convenience of traditional cellular phones with the global reach of Iridium’s low-earth-orbit satellite constellation. Traditional cellular service is limited by the physical location of cellular service towers. Iridium, on the other hand, through the combination of satellite and cellular services, expects to provide service virtually anywhere in the world. This is because Iridium’s satellites will act as “towers in the sky,” providing satellite coverage in many areas where traditional cellular service is unavailable.

In its 1997 bank line of credit for $800 million, Iridium agreed to a covenant that required it to have at least 52,000 total subscribers by the end of March 1999 or risk defaulting on the debt.

Did this mean anything.

A key service limitation identified by Iridium in the same SEC filing of November 13, 1998, was the lack of phone service availability in places where obstructions such as buildings and other natural and man-made obstacles were positioned between a satellite and the user. These adverse effects on satellite calls would increase as the obstacles became larger and more closely spaced. For this reason, the system would not function well in urban areas, inside buildings constructed with steel, and inside moving automobiles.

Weighing in fully loaded at about a pound (500 g) and the size of a small brick (seven inches long), the phone required special training to use and came accompanied by a bag of attachments whose functions were difficult to understand. The user manual for the Iridium phone was more than two hundred pages long.

A Bell Telephone Company executive, whose company declined to invest in Iridium, recalled sitting through a Motorola Iridium presentation in the early 1990s and being startled by one slide. It said that user “dexterity” was important in using the service.5 In other words, customers had to position themselves so that nothing blocked the path between the phone’s large antenna and the orbiting satellites. Otherwise, it would not work.

Iridium phones were launched at a suggested retail price of approximately $3,000. Many competitive smaller cell phones were priced near $100 at the time. In some competitive markets, phones were given away free to attract customers. Global Iridium service charges ranged from $4 to $9 a minute. Charges for many competitive wireless calls, though not global, were as low as ten cents a minute.

Europe had launched a cellular standard called GSM (global system for mobile communications) that enabled international roaming with cell phones. GSM phones operated in more than one hundred countries for pennies a minute. The number of GSM subscribers had increased from 1.3 million in 1994 to 150 million in 1999 (see Exhibit 1), a rapid adoption that took Motorola by surprise. Areas not served by mobile phones had disappeared faster than forecasted.

David Greising, a reporter for the Chicago Tribune, paid a visit to Iridium headquarters in Washington, D.C., and found that the phone was unreliable indoors as well. He asked for a demonstration of the Iridium phone and was taken to the roof of the building. The Iridium marketing manager tried to connect a call to the system from the roof, but was unsuccessful until the eighth try. Designing a satellite system with sufficient signal strength to penetrate buildings would have increased the Iridium market by a factor of ten.

Although Iridium was proud to be the pioneer in the satellite telephony market, three competitors waited in the wings. Globalstar, ICO Global Communications, and Ellipso hoped to enter the market shortly after Iridium. These innovative “fast followers” hoped to learn from Iridium’s experience, and used more powerful second-generation technology. Both Globalstar and ICO declared third world villages to be among their key targets. Another company, Teledesic, which was backed by Craig McCaw and Bill Gates, was attempting to develop a $9 billion satellite-based “Internet in the sky.” Many potential Iridium customers may have taken a wait-and-see approach as these new global telecommunication services launched their publicity campaigns.

The Iridium company and board relied extensively on outside consultants for assistance in developing a marketing strategy. Iridium launched a $140 million global advertising campaign to create brand awareness two months before the phones were ready for sale. The campaign, using the slogan “Freedom to Communicate,” emphasized that Iridium was the first truly global, personal telecommunications system. According to the ads, Iridium would allow voice, data, fax, and paging messages to be transmitted to anyone from virtually anywhere at any time. The target market was anyone who might require wireless telecommunications, which meant a target market of many millions. The ads, according to some observers, were “schmoozy and generic” and failed to distinguish Iridium from other wireless companies. Sometime later, analysts speculated that too much emphasis on the technology was the root cause for the lack of focus in the marketing campaign.

Iridium left distribution up to its regional partners, but companies such as Sprint, which owned 3.5% of Iridium, were not selling the phones or service before the launch of the new system. Sprint’s sales force did not push the service and its stores did not stock the handset. Therefore, Sprint, Motorola, and other partners, such as Telecom Italia, had to train their sales teams to sell the Iridium service. Moreover, business travelers, the primary target market, were reluctant to replace even a handful of small cellular phones with a large handset which weighed a pound, cost over $3,000 to purchase, was expensive to use, and could barely fit into a briefcase.

Points from the Prospectus and Financial Statements

Notes will be, and the Original Notes are, senior obligations of the Issuers ranking pari passu in right of payment to all other existing and future senior Indebtedness (as defined) of the Issuers, other than Indebtedness that is expressly subordinated to the Notes.

Upon the occurrence of a Change of Control (as defined), each Note Holder may require the Issuers to repurchase all or a portion of such Note Holder's Notes at a price equal to 101% of the principal amount thereof, plus accrued and unpaid interest and Liquidated Damages, if any, to the purchase date.

To estimate potential demand for its services, Iridium has engaged in extensive market analysis, including primary market research which involved screening over 200,000 persons and interviewing more than 23,300 individuals from 42 countries and 3,000 corporations with remote operations. Based on this market analysis, Iridium has identified five target markets for Iridium World

Services:

traveling professionals;

corporate/industrial;

government;

rural;

and aeronautical.

Iridium expects the traveling professional and corporate/industrial markets will provide most of the demand for Iridium World Services. Iridium believes that individuals in these markets are more likely to need and have the ability to afford hand-held, global mobile communications capability than, for example, individuals who live in remote areas outside existing distribution channels for wireless communications services.

Not interested in marketing mistakes – was bankable and how should have modeled the project for credit analysis.

There is no service available today which approximates the hand-held, satellite-based service Iridium expects to provide. The Iridium satellite system is not intended to provide communications services that compete with terrestrial wireless and paging services where they are available because of the advantages such wireless and paging systems generally have in terms of cost, voice quality, signal strength and ability to penetrate various environments (such as buildings). Iridium expects that it will be able to charge its service providers wholesale usage fees for Iridium World Satellite Services that are significantly higher than the wholesale usage fees currently charged by most terrestrial wireless services. There can be no assurance that this premium pricing will not adversely affect demand for such services and, accordingly, adversely affect Iridium's ability to generate sufficient operating revenues.

Based upon current testing and simulations, Iridium subscribers using Iridium World Satellite Services via portable, hand-held phones should expect some degradation in service quality and availability to occur in environments where obstructions, such as trees, buildings and other natural and man-made obstacles, are positioned between a satellite and the user. The severity of this degradation will increase as the obstacles become larger and more densely spaced. Only extremely limited satellite voice service, or no satellite voice service, is expected to be available in densely packed urban environments or inside buildings with steel construction and metal coated glass common in many urban high rise buildings (including, in particular, in most hotels and professional buildings). In addition, because the structure of automobiles will tend to obstruct the satellite signal, use of a hand-held Iridium phone in a moving automobile will make the effect of environmental obstructions temporary but more pronounced. The actual limitations will vary, sometimes significantly, as actual situations and conditions change and as the satellites move across the sky. Iridium World Page Services will also be unable to provide service in certain environments where terrestrial paging generally would. While Iridium believes that the addition of Iridium World Cellular Services and the availability of multi-mode phones will lessen the effect of these obstacles by providing access to local cellular service (if available and if the local cellular provider has an agreement in place with Iridium) in environments in which Iridium World Satellite Services are unavailable or degraded, there can be no assurance that (i) Iridium's expectation will be correct as to subscribers' willingness to accept service limitations, higher prices and heavier hand-held phones and larger pagers than those to which such subscribers may otherwise be accustomed in order to have the ability to make and receive calls on a worldwide basis with a single phone or to receive pages on a

Iridium believes that its success is dependent on the development of satellite phones which are portable and hand-held and pagers which may be worn on a belt. Moreover, Iridium's business plan assumes that there will be multi-mode versions of the phone capable of operation with most of the major terrestrial wireless system standards so that a subscriber can use the same phone for terrestrial wireless service, including Iridium World Cellular Services, and for Iridium World Satellite Services. The phone and pager for the IRIDIUM System are still under development. Motorola has informed Iridium that the portable, hand-held phone that Motorola is developing is expected to be larger and heavier than today's pocket-sized terrestrial wireless phones and is expected to have a significantly longer and thicker antenna than hand-held terrestrial wireless telephones. Iridium expects that the Kyocera phone will be relatively the same size and weight as the Motorola phone. The pager Motorola is developing is slightly larger than today's standard alphanumeric belt-worn pagers.

Subscribers will generally purchase equipment from service providers. Iridium does not currently intend to manufacture or distribute Iridium subscriber equipment or derive any significant income from the sale of Iridium subscriber equipment. See "-- Potential for Delay and Cost Overruns -- Development, Manufacture and Distribution of Subscriber Equipment." Based on information received from Motorola, Iridium expects that Motorola's version of the multi-mode portable, hand-held phones will have an initial retail price of approximately $3,000, including one TRC, with each extra TRC having an initial retail price in the range of $500 to $1,000. Motorola's version of the alphanumeric pager is expected to have an initial retail price of approximately $500. These projected prices substantially exceed today's prices for terrestrial wireless phones and pagers and may also exceed prices for subscriber equipment of competing satellite-based systems. The cost of Iridium hand-held phones and pagers, as well as anticipated usage fees, may limit demand for Iridium World Services, particularly among individual purchasers. If such prices and fees significantly limit demand, Iridium's ability to generate sufficient operating revenues could be adversely affected. Motorola has made no commitment to sell subscriber equipment at these estimated prices. Kyocera has not yet advised Iridium as to the expected pricing of its hand-held phone.

To provide commercially adequate service, ensure user acceptance and operate successfully, the IRIDIUM System will have to provide minimum levels of availability of Iridium World Satellite Services, which will depend upon system capacity. Various factors, including usage patterns, will have a significant impact on the capacity of the IRIDIUM System for a particular geographic area and on a system-wide basis. Most important among these are usage patterns and spectrum allocation. Iridium could experience unexpected usage patterns which could exceed the capacity of the IRIDIUM System through one or several gateways. If Iridium faces significant capacity issues, its ability to increase its spectrum assignment in any market is subject to significant regulatory hurdles. There can be no assurance that the necessary spectrum assignments will occur or that adverse and unanticipated usage patterns will not materialize. Failure to achieve a commercially viable capacity level for any reason, including but not limited to those mentioned in this section, would materially and adversely affect Iridium.

Substantial Subscriber Ramp-up and Revenue Generation Problems. Iridium believes that its slower than expected subscriber ramp-up and revenue generation have been initially the result of problems with the initial distribution of subscriber equipment, a shortage of fully-trained service providers and sales personnel and a lack of effective marketing and distribution of Iridium World Services by Iridium, its gateways and its service providers. During the initial roll-out of Iridium World Services, (i) Kyocera experienced significant difficulties in achieving Iridium's quality control standards and was unable to ship significant quantities of phones until early March of 1999, (ii) there were substantial difficulties in distributing phones and pagers to various markets around the world, (iii) although Motorola's satellite phones and pagers were available, the production of cellular cassettes for its dual mode satellite/cellular phones and some other accessories was delayed, and (iv) Iridium and its gateway operators had difficulty identifying and training service providers and their sales staffs.

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Iridium believes that, as a result of various factors, significant portions of its target markets have developed negative impressions about the quality and pricing of Iridium World Services. Iridium is in the process of developing and implementing various initiatives to appropriately address this problem. For example, Iridium has found that its initial service pricing was too complex and has undertaken a process of simplifying these prices as part of the revisions to its business plan.

Revision of Business Plan -- Revenue Generation and Cost Structure. While Iridium believes that the initial problems with the availability of satellite phones and pagers largely have been addressed, Iridium believes that its strategy for marketing and distribution of Iridium World Services, including its method for implementing its business strategy with its gateways and service providers, needs to be revised. Accordingly, Iridium and its gateways are in the process of revising Iridium's business plan to increase subscriber ramp-up and revenue generation. The initiatives Iridium and its gateways are developing likely will take time to finalize and implement.

Iridium also is in the process of revising its revenue and subscriber estimates in light of its initial marketing and distribution difficulties and its expected revisions to its business plan. Iridium expects this revision will result in significantly lower estimates of revenues from operations and accordingly, will adversely affect its prior expectation about its financial condition, including (i) its ability to meet the minimum revenue and subscriber covenants and other terms of the secured bank facility, (ii) its future sources of funds from revenues from operations and (iii) its financing needs.